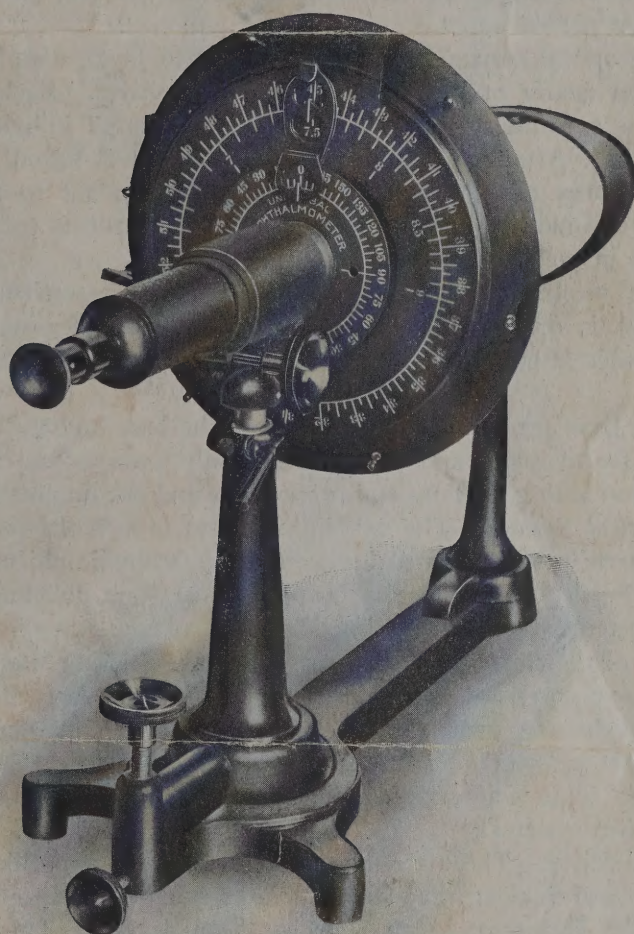


The Universal Ophthalmometer

(Patented Oct. 24, 1911)



The Universal Ophthalmometer

Javal-Schiötz System

(Model 1912)



We have embodied in this ophthalmometer every advantage suggested to us in an experience of over twenty years in the manufacture and sale of this and similar instruments. As a result we offer an instrument which, besides being absolutely dependable so far as optical accuracy is concerned, possesses every mechanical device for making its manipulation convenient and reducing the technique of making corneal measurements to the fewest possible steps.

The optical system is strictly according to Javal, with Wollaston bi-refrangent quartz prisms and achromatic objectives. Each part of this system is accurately ground to formula and tested individually before assembling. After the instrument is complete it is tested on spherical glass surfaces of different curvatures corresponding to the range of curvatures found in human corneas. This procedure secures absolute accuracy in each instrument.

The mechanical parts are constructed and assembled with great care, and, in order to produce an instrument of pleasing appearance, considerable attention has been paid to the design in general and to the finish.

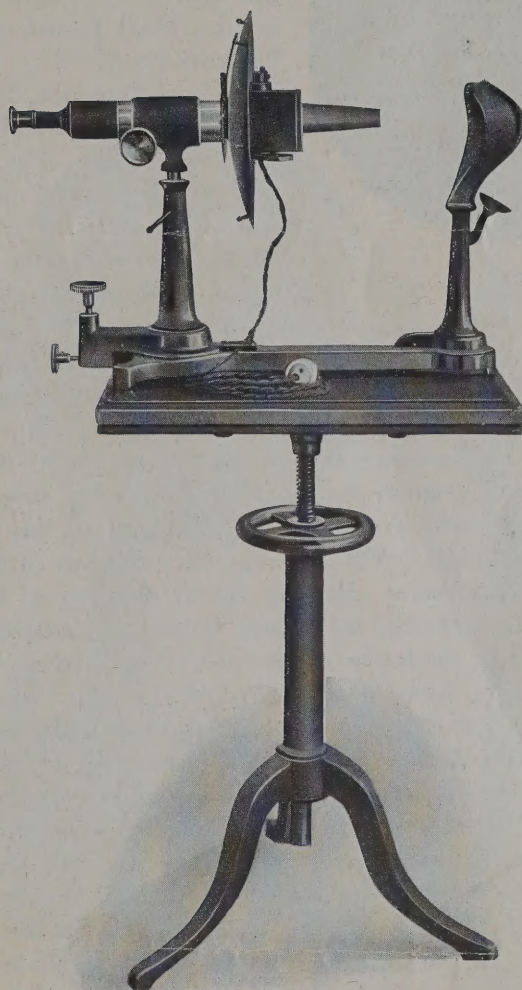
We have produced in the design of the base and the columns supporting the telescope and head-rest not only a stable and rigid support, but a form with good lines and proportions and not displeasing to the eye.

Optical System.—The doubling element is a Wollaston bi-refrangement quartz prism mounted between two achromatic objectives, this being the Javal-Schiötz optical principle of a constant doubling element.

Advantages.—Quartz prisms have an advantage over glass prisms, because of the clearness of the corneal image, showing slight amounts of overlapping corresponding to 0.25D and upward. A further advantage is that slight movements of the head on the part of the operator do not disturb the *relationship* of the images of the mires when quartz prisms are used. This is a very annoying factor in ophthalmometers containing glass prism systems.

The Mires.—These are the parallelogram and steps likewise devised by Javal and Schiötz some years ago. In spite of numerous experiments with other forms, no better mire has been devised. This mire is particularly sensitive in determining the continuity, or lack of it, of the central black line.

Focussing Adjustment.—The telescope is supported in a sleeve at the upper end of the column, in which it may be racked back and forth for focussing by means of a milled wheel at side.



Price	\$95.00
With Universal Stand.....	18.00
	\$113.00



FIG. I.

Leveling Adjustment.—The telescope is raised or lowered to bring it to the level of the patient's eye by means of a lever concealed in the base and operated by the milled wheel and vertical shaft placed near the end of the instrument.

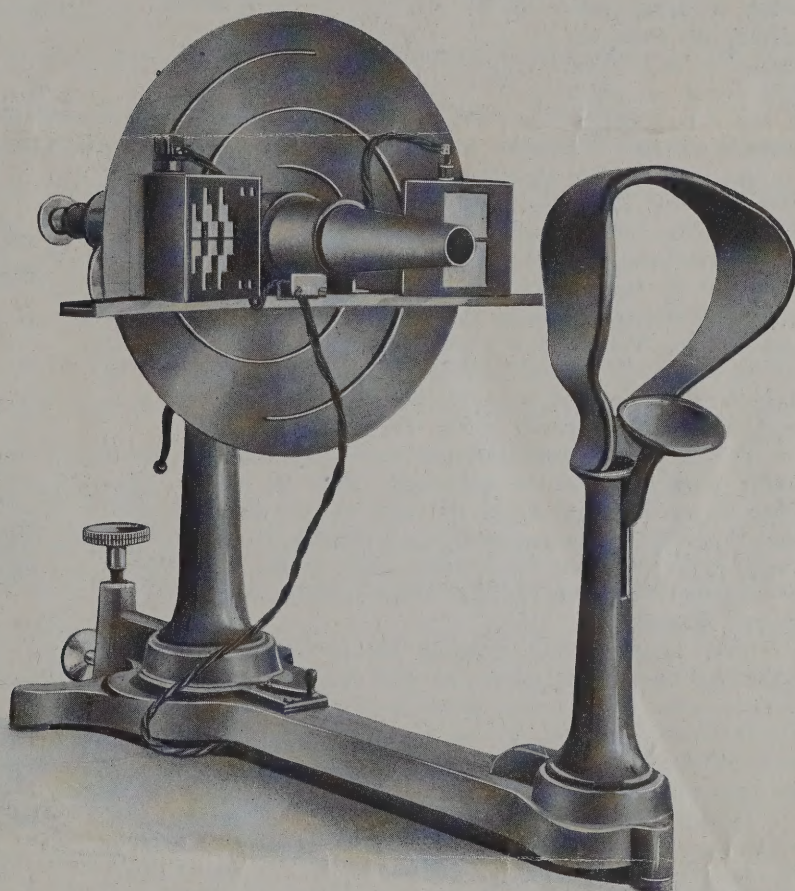
Head-Rest and Adjustable Chin-Piece.—This head-rest is of an entirely new form. The part presented for the reception of the patient's face is the slightly lipped edge, having the proper contour. It is more comfortable and cleaner than the old style with flat sides and top. The chin-rest is

rubber enamelled covered metal, and is raised and lowered by means of a horizontal shaft, and can be operated from the examiner's end of the instrument.

The Mire Mechanism.—The mires are controlled through an entirely new method, original in this instrument. The large dial is made to revolve independently of the telescope and arc, and has mounted on its concave face two spiral tracks. On the back of each of the mire boxes is a groove-like attachment engaging one of these spiral tracks. As the dial is revolved, therefore, the mires, following the spiral, are moved along the arc to or from the center, according to the direction of the rotation of the dial. Small posts are mounted at short intervals near the periphery of the dial on its convex side so that it may be conveniently revolved from any point—the operator is relieved of the necessity of visually locating this control. Other advantages of this method are the relatively large movement of the dial to small movement of the mires—a "fine" adjustment, the large open diopetre scale (see description) and the great mechanical simplicity; there are no small moving parts.

Mire Recording Scale.—From the outer scale, in Fig. I, is obtained the amount of astigmatism in dioptries. It is graduated to quarter dioptries. Two pointers (with double oval openings) are provided, one of them indicating the focus of the primary position, the other one the focus of the secondary position, the difference being the astigmatism. The primary pointer is stationary with regard to the scale. It does not change its reading unless moved by hand. The secondary pointer changes its reading with every movement of the mires.

Axis Scale.—The inner circle, on Fig. I, shows the axis scale. The small pointer moves with the telescope and records the position of the mires.



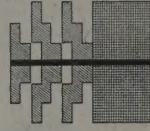
FRONT VIEW

The Mires

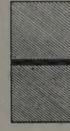
The mires which travel on the arc are two targets, one a parallelogram and the other a figure consisting of steps arranged so as to show the extent to which



A



A B



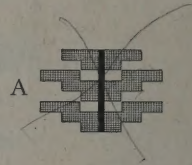
B'

FIG. IV.

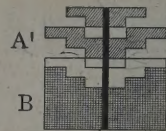
a step image overlaps a plain image. Both mires have horizontal black lines running through the center, the purpose of which will appear hereafter.

As seen through the telescope, the mires are doubled, as shown in Fig. IV. Only the two central mires are considered, however, the outer images being neglected. A and B represent the ordinary images and A' and B' the extraordinary. If the mires are spaced about 20 cm. apart (equal to 40 D on the scale) the distances between the inner edges of the same pairs, A and B (or A' and B'), is 3 mm., equal to the doubling element of the prism and the extraordinary image of the steps will be tangent to the ordinary image of the parallelogram. This position of the mire is shown in Fig. IV.

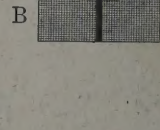
For the sake of demonstration, we will presume the cornea under examination to be astigmatic "with the rule." Then when the arc is turned 90° to the right into the secondary position, the image will appear as shown in Fig V, the extraordinary image of the steps and the ordinary image of the parallelogram overlapping—the white of the super-imposed area being of greater intensity.



A



A'



B



B'

FIG. V.

Two facts to which attention has previously been called must now be borne in mind, (1) The doubling element of the prism remains 3 mm. as long as the eye is placed at the center of the curvature of the arc; (2) the size of the image (i. e., the distance between the inner edges of the same pair, AB) varies as the curvature of the cornea.

In other words, the distance between A and its extraordinary image A', and likewise the distance between B and B', may be considered fixed, while the distance between A and B varies with the curvature of the cornea, as explained under Theory of Corneal reflections.

In the case shown in Figs. IV and V, the curvature in the vertical meridian being *less* than in the horizontal, the size of the image is decreased and the two central images overlap. If, on the contrary, the eye under examination were astigmatic "against the rule," the mires would separate in the secondary position. Each "step" of overlapping represents one dioptré, and the reading was formerly made from the image in this way.

In the present model the readings are taken from a scale to which all movements of the mires are transmitted.

Directions for Using the Universal Ophthalmometer

Seat the patient so that the horizontal part of the head-rest is just above the brows, adjusting the chin-rest by means of the milled wheel at the operator's end of the instrument so that the head will be supported in this position.

By looking through the sight holes lateral to the telescope the eye can be located.

Find the image by raising and lowering by means of the adjustment at the side of the upright column and swinging the instrument to the right or left, as may be required. Focus the image by means of the milled wheel at the side of the telescope.

Locate the primary axis by revolving the telescope, taking hold of the part covered with leather until the continuity of the two central black lines through the mires is established. Bring the mires together so that their edges just touch by revolving the large dial, which may be grasped at the most convenient point.

There are two pointers operating on the dioptré scale; both have two oval openings, but one of them has an extension hook. When the examination has proceeded to this point, the pointer with the extension is to be moved by hand so that it is directly in the back of and covered by the other pointer.

Revolve the instrument 90 degrees into the secondary position. If the eye under examination is astigmatic, the mires in the image will appear either separated or overlapped. Now adjust the mires by means of the large dial so that their edges just touch as they did in the primary position. It will then be noted that the dioptré pointers occupy two different positions on the scale, and the difference between them is the astigmatism in dioptries. For example: If one pointer is at 43 and the other 45 on the scale, the astigmatism would be two dioptries.

The inner circle of the larger scale registers the curvature of cornea in dioptries.

The axis is shown on the smaller scale.

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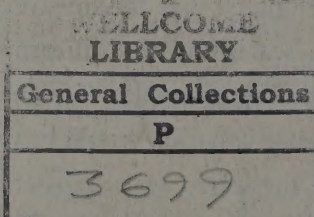
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